

PATENT

Serial No.: 10/733,160
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Art Unit: 3679
Examiner: Michael P. Ferguson
Applicant: Robert L. Doubler and John E. Hammill, Sr.
Title: INTERNALLY DISPOSED LINEAR FASTENER SYSTEM
Conf. No.: 5934

Cincinnati, Ohio 45202

June 9, 2006

Mail Stop Amendment
Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AFTER FINAL AMENDMENT

Sir:

This is responsive to the Office Action dated April 19, 2006.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 6 of this paper.

Remarks/Arguments begin on page 14 of this paper.

Amendments to the Specification:

Please replace the paragraph beginning at pages 15, line 14, with the following rewritten paragraph:

-- Referring to FIGS. 3 and 7, the body member 11 comprises a generally cylindrical outer surface 16 having a first end 18 and a second end 20. The body member 11 may be constructed of materials well known in the art which may include but should not be limited to steel, bronze, brass, copper, aluminum, plastic, ceramic, or rubber, as well as suitable combinations thereof. The first end 18 of the body member 11 includes a cavity 22 and a driving means. In the preferred embodiment the cavity 22 includes an engaging surface 26, the engaging surface tapering inwardly beginning at the first end and extending toward the second end of the body member 11. In the preferred embodiment the engaging surface includes a self-holding taper such as a ~~Morse, Brown & Sharpe (Jarno), American National Standard Machine Taper (Jacobs), British Standard Tapers~~ MORSE, BROWN & SHARPE (JARNO), AMERICAN NATIONAL STANDARD MACHINE TAPER (JACOBS), BRITISH STANDARD TAPERS and the like all well known in the art. Alternatively, self-releasing tapers well known in the art suitable for circumferential expansion of the upper portion 28 of the body member 11 may be used. The driving means comprises at least one and preferably a plurality of driving surfaces 24. In the preferred embodiment the driving surfaces 24 are constructed and arranged to cooperate with a standard hex wrench (not shown). However, it should be noted that other spline and slot type driving sockets well

known in the art suitable for inserting and removing threaded fasteners may also be used. The second end 20 of the set screw body is constructed and arranged as a clamping surface 30 (FIG. 2). The clamping surface 30 in the preferred embodiment is a flat point. However, it should be noted that other set screw points (not shown) such as a dog point, half dog point, cup point, oval point, cone point or knurled point, all well known in the art, may be utilized with the instant invention. The body member 11 preferably includes a radially projecting means for engaging the inner surface of an aperture illustrated herein as outwardly and circumferentially extending rib(s) 32 (FIG. 2) positioned about a central axis. Each circumferentially extending rib 32 being constructed with a first ramp surface 36 to allow the set screw member to slide into the aperture and a second ramp surface 38 to allow a second clamping force as the engagement of expander 12 causes radial expansion of the set screw body 11. In further embodiments, the outer gripping surface may also include any number of surface finishes well known in the art to enhance the gripping action between the set screw body and cooperating aperture, including but not limited to, threads, knurling, snap ring grooves, generally smooth and/or tapers, or suitable combinations thereof, as well as other surfaces suitable for providing adequate grip between the set screw body 11 and the inner surface of an aperture 40 to secure an assembly. The upper portion 28 of the body 11 includes at least one generally vertical slot 48 extending from the upper portion 28 of the set screw body 11 toward the second end 30. The vertical slot(s) 48 facilitates translation of the radial and outward forces created upon insertion of the

expander member within the upper portion 28 of the body member 1 into a relatively uniform circumferential expansion of said body member 11. –

Please replace the paragraph beginning at pages 17, line 21, with the following rewritten paragraph:

-- Referring to FIGS. 4 and 8, the expander member 12 comprises a body 46 having a first end 42 and a second end 44. The outer surface 48 in the preferred embodiment having a frustaconical taper generally conjugate to the taper within the set screw body cavity 22. In the preferred embodiment the outer surface taper 48 is a self-holding taper such as a ~~Morse, Brown & Sharpe (Jarno), American National Standard Machine Taper (Jacobs, British Standard Tapers~~ MORSE, BROWN & SHARPE (JARNO), AMERICAN NATIONAL STANDARD MACHINE TAPER (JACOBS), BRITISH STANDARD TAPERS or the like all well known in the art. Alternatively, other tapers well known in the art suitable for circumferential expansion of the upper portion 28 of the set screw body 11 may be used. The expander member 12 may include an inner bore 50 extending inwardly from said first end of said expander member along a longitudinal centerline for gripping the expander member 12 for extraction from the set screw body 11. The inner surface may also include a driving means such as, but not limited to threads, sockets or slots for engagement with wrenches, screwdrivers and/or an extractor (not shown) used to remove or disconnect the coupling. Alternatively, the expander member 12 may include a flange 52 (FIGS. 6 and

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8) at its second end 44, the flange 52 having a larger diameter than the second end 44 of the expander member 12 to remove or disconnect the coupling. In a further alternative embodiment the outer surface of the expander body includes connection means (not shown) which allow the set screw member and the expander member to be interlocked into a coaxially aligned sub-assembly prior to insertion into an aperture. Suitable connection means include adhesives, living hinges and the like.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-4. (Cancelled)

Claim 5. (Previously Presented) A linear engaging headless fastener system for securing an object to a machine component, the fastener system comprising:

a body member having an outer surface positioned about a central axis, said body member having a first end including a cavity, said cavity having an engaging surface, said engaging surface tapering inwardly from about said first end and extending toward a second end, said second end defining a clamping surface adapted to engage the object;

an expander member having a first end, a second end, and an outer surface positioned about a central axis, said outer surface tapering outwardly from said first end and extending toward said second end, said first end being insertable into said body member cavity;

a gripping surface defining an aperture in the machine component; and

means projecting radially from said outer surface of said body member outer surface for engagement with said inner surface of said aperture for locking said body member in a predetermined position,

wherein said outer surface of said expander member is constructed and arranged for coaxial alignment and engagement with respect to said engaging surface of said body member, said expander member being linearly traversable with respect to said engaging surface of said body member between a first release position and a second engaged position, wherein said engaged position results in said tapered surfaces circumferentially expanding said body member, and wherein said release position results in circumferential contraction of said body member,

wherein said body member outer surface and said gripping surface are configured and positionable relative to each other to form a compressive contact with each other to linearly shift relative to each other under the compressive contact to cause an increased compression between the clamping surface and the object when said body member is circumferentially expanded from an unloaded state,

wherein said radially projecting means includes at least one outwardly and circumferentially extending rib, each said rib including a first ramp surface to facilitate coaxially aligned linear movement of said body member in relation to said inner gripping surface of said aperture to provide a secondary clamping force upon engagement of said expander member,

wherein said at least one circumferentially extending rib includes a second ramp surface to facilitate coaxially aligned linear insertion of said body member into said inner gripping surface of said aperture, and

wherein said radially projecting means are helical threads.

Claim 6. (Cancelled)

Claim 7. (Previously Presented) A linear engaging headless fastener system for securing an object to a machine component, the fastener system comprising:

a body member having an outer surface positioned about a central axis, said body member having a first end including a cavity, said cavity having an engaging surface, said engaging surface tapering inwardly from about said first end and extending toward a second end, said second end defining a clamping surface adapted to engage the object;

an expander member having a first end, a second end, and an outer surface positioned about a central axis, said outer surface tapering outwardly from said first end and extending toward said second end, said first end being insertable into said body member cavity; and

a gripping surface defining an aperture in the machine component,

wherein said outer surface of said expander member is constructed and arranged for coaxial alignment and engagement with respect to said engaging surface of said body

member, said expander member being linearly traversable with respect to said engaging surface of said body member between a first release position and a second engaged position, wherein said engaged position results in said tapered surfaces circumferentially expanding said body member, and wherein said release position results in circumferential contraction of said body member,

wherein said body member outer surface and said gripping surface are configured and positionable relative to each other to form a compressive contact with each other to linearly shift relative to each other under the compressive contact to cause an increased compression between the clamping surface and the object when said body member is circumferentially expanded from an unloaded state, wherein said first end of said body member includes at least one driving surface, said at least one driving surface constructed and arranged to cooperate with a driving tool for providing rotational force to said body member.

Claim 8. (Cancelled)

Claim 9. (Previously Presented) A linear engaging headless fastener system for securing an object to a machine component, the fastener system comprising;

a body member having an outer surface positioned about a central axis, said body member having a first end including a cavity, said cavity having an engaging surface, said

engaging surface tapering inwardly from about said first end and extending toward a second end, said second end defining a clamping surface adapted to engage the object;

an expander member having a first end, a second end, and an outer surface positioned about a central axis, said outer surface tapering outwardly from said first end and extending toward said second end, said first end being insertable into said body member cavity; and

a gripping surface defining an aperture in the machine component,

wherein said outer surface of said expander member is constructed and arranged for coaxial alignment and engagement with respect to said engaging surface of said body member, said expander member being linearly traversable with respect to said engaging surface of said body member between a first release position and a second engaged position, wherein said engaged position results in said tapered surfaces circumferentially expanding said body member, and wherein said release position results in circumferential contraction of said body member,

wherein said body member outer surface and said gripping surface are configured and positionable relative to each other to form a compressive contact with each other to linearly shift relative to each other under the compressive contact to cause an increased compression between the clamping surface and the object when said body member is circumferentially expanded from an unloaded state,

wherein said first end of said body member includes a plurality of driving surfaces, said plurality of driving surfaces constructed and arranged to cooperate with a driving tool for providing rotational force to said body member.

Claim 10. (Original) The linear engaging fastener system of claim 9 wherein said plurality of driving surfaces are adapted to cooperate with a hex-shaped tool.

Claims 11-26. (Cancelled)

Claim 27. (Previously Presented) A fastener comprising:

a body member defining a longitudinal axis and comprising a clamping end adapted to engage an object to be fastened, and an expandable portion radially expandable relative to the longitudinal axis, the expandable portion having an inner surface defining a cavity in the body member and an outer surface;

an expander member having an outer surface and sized to be at least partially positionable inside the cavity of the body member; and

a machinery component comprising a gripping surface defining a cavity sized to accommodate at least a portion of the expandable portion of the body member and to engage the outer surface of the body member,

wherein the outer surface of the expander member and the inner surface of the expandable portion of the body member are configured to cooperate to radially expand the expandable portion when the expander member axially slides along the longitudinal axis, and wherein the outer surface of the expandable portion of the body member and the gripping surface are configured to cooperate to push the body member along the longitudinal axis relative to the gripping surface, thereby compressively engaging the clamping end with the object to be fastened, as the expandable portion radially expands,

wherein at least one of the outer surface of the expander member and the inner surface of the expandable portion of the body member has a portion at an angle from the longitudinal axis and adapted to remain in contact with the other one of the outer surface of the expander member and the inner surface of the expandable portion of the body member during the longitudinal advancement of the expander member

wherein at least one of the outer surface of the expandable portion of the body member and the gripping surface has a portion at an angle from the longitudinal axis and adapted to remain in contact with the other one of the outer surface of the expandable portion of the body member and the gripping surface during the radial expansion of the expandable portion of the body member, wherein the outer surface of the expandable portion of the body member and the gripping surface comprise matching ribbed surfaces.

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Claim 28. (Previously Presented) The fastener of claim 27, wherein the matching ribbed surfaces comprise matching threaded surfaces.

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REMARKS

This is responsive to the final Office Action dated April 19, 2006 in which claims 5, 7-10, 27 and 28 were allowed. Applicants greatly appreciate the allowance of these claims. Claims 1-4, 6 and 11-26 were rejected under §§ 102 and/or 103 based upon identified prior art. In an effort to advance this application toward allowance, Applicants have cancelled each of the rejected claims herein, but reserve the right to pursue patent protection for the inventions of those cancelled claims in related applications.

The specification has been amended herein to capitalize identified trademarks as suggested in the Office Action.

In that each rejection, objection and issue identified in the final Office Action has been addressed herein and all claims now pending in this application have been allowed, Applicants respectfully request that this amendment be entered in its entirety and that a Notice of Allowance be issued by the Examiner in due course. If the Examiner feels that any matter in this case requires further attention prior to issuing a Notice of Allowance, he is respectfully asked to telephone the undersigned attorney so that the matter may be promptly resolved.

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Respectfully submitted,

WOOD, HERRON & EVANS, L.L.P.

By /Keith R. Haupt/
Keith R. Haupt
Reg. 37,638

2700 Carew Tower
Cincinnati, Ohio 45202
(513) 241-2324
FAX (513) 421-7269
khaupt@whepatent.com (email)
K:\ZMS\EF09US\AF Amend.wpd